# OBSERVING WITH PROEM CAMERA – LIGHTFIELD
# January 26, 2015

## Introduction

Before going to the mountain, you cannot forget to bring an extra data storage (CDs, DVDs, external HD, ...) as well as the list with all your target information. Of course, you should know what you are aiming for, to minimize the chances of losing precious observing time.

## Problems? Doubts?

In case anything happens, do not hesitate in calling Dave Doss (675 or 111) or the observing support (Coyne 661 or 114, John 665). Check the telephone numbers in the control room and the instructions to use the pager.

Keaton's phone number: 206-370-1455. Sam's phone number: 512-516-3464.

## The afternoon

The observing fun starts early in the first afternoon prior the run. If this is the first night of your first run, allow yourself some time for the set up before sunset. Your tasks as observer are:

1. **Power on ProEM.** The switch button is on the East-side of the instrument. It will take about 30 min to stabilize the temperature on the camera.

2. **Set up computers**

   There are 2 computers (besides your own): **windows computer** and **guide82 computer**.

   **Argos-dev computer** is the acquisition computer. This computer should be on, but if it is not, turn it on and boot into driver labeled `Windows 7 Enterprise 64-bit`.

   (a) Open `LightField` (double-click on Desktop icon). It takes about 1/2 hour for the camera to cool down to -55°C.

   (b) Load Experiment: click on folder icon (center icon, top left corner of `LightField` software. (default_experiment).

   (c) Confirm that `Domain Time II Client` is running: Click `Start menu` > `Control Panel`. Shift_right click `Domain Time II Client` and Run as administrator. Click `Show details` > `yes`. If Domain Time box is not running, click `Start Service`. Close window.

(d) Open shortcut folder `Trimble` on Desktop. Shift_right click on `TrimbleVTS.exe` to start time keeper. Click `Run as administrator`. Click `Show details` > `yes`. Minimize the `Trimble VTS` window.

(e) Make a directory to save the data. Click on Folder icon > Data (D:) > sync_to_White_Dwarf_Archive > 20150124. Inside this folder, create sub-folders: bias, dark, dome_flat. Later on, we will create the directories for the targets.

(f) Click on the `cactus icon` (top right side) and click on `Always Auto Scale` for best contrast.

**Guide 82 computer** controls the telescope.

(a) Click on icon `Track82_ProEM`. To start tracking the telescope, click on `RA ON` . You can load an observing list as a text file and/or include new targets on the right window.

Click on the coordinates of the target you want to observe. Go to the dome and hold `Shift` and click on `GO`. If the telescope is too low or the target is too far from the current position, you will have to manually move the telescope.

(b) Click on icon `Guide82`. To start getting images, you need to be on a target.

**Your computer** is not a requirement for your observing run, but if you have one, you can use it to reduce the data and/or monitor the weather. Here are some useful links:

*http://observatories.hodar.com/mcdonald/night.html*

*http://weather.as.utexas.edu*

And some data can be obtained at:

*http://weather.as.utexas.edu/cgi-bin/latest_5min.cgi*

This is the ip address of the official weather station of McDonald Observatory. In cloudy nights, you can check this website in the comfort of your bed. It will tell you if you can open the dome or not.

3. **Setting up the instrument**

Between the camera and the telescope, there is a filter wheel. If you are not sure of which filter position is the BG40 filter, you may open it up on the East-side and look. There is only a small screw to be removed by hand and the cover will come off.

On the West-side, there is a pin. By pushing it in, you block the light path into the detector. That is the dark position.

4. **Calibrations**

You will probably want to do the calibrations before dinner, even if the forecast is not very promising. If you run into troubles, the day crew will still be around to give you a hand.

(a) Bias frames: mirror covered, filter box aperture closed (push brass knob in), all lights off.

Exposure time: 0s, Number of frames: 31, File name: bias, Save In:

D:\sync_to_White_Dwarf_Archive\YYYYMMDD\bias (click on the ... icon above the Filename).

Shutter_mode always closed.

Click `1` to run once or `Run` to make forever. When you are happy, click `Acquire`. It will stop after 31 frames.

(b) Dark frames: mirror covered, filter box aperture closed (push brass knob in), all lights off.

Exposure time: 29.998s, Number of frames: 31, File name: dark_30s, Save In:

D:\sync_to_White_Dwarf_Archive\YYYYMMDD\dark

Click `1` to run once or `Run` to make forever. When you are happy, click `Acquire`. It will stop after 31 frames.

(c) Dome Flats: open mirror cover, extend the baffle tube, move filter box aperture to filter (pull brass knob out), move the telescope to 0 HA and -40 RA, dome facing East. Turn on the flat Variac lamp to count about 27 000 ADU.

Exposure time: 2.998s, Number of frames: 31, File name: dome_flat_BG40, Save In:

D:\sync_to_White_Dwarf_Archive\YYYYMMDD\dome_flat

Click `1` to run once or `Run` to make forever. When you are happy, click `Acquire`. It will stop after 31 frames.

5. **Opening the dome**

After dinner, if the weather is fine, you can start cooling down the dome. Open the east doors, raise the upper curtain, open the dome, the mirror cover and extend the baffle tube.

There are some cases where you cannot open the dome: high humidity, high winds, and/or high particle count. For humidity above 90%, you should check for condensation inside the dome, but above 95% you must close. For particle counts between 50 000 and 100 000, you have to monitor the conditions with the powerful flashlight, checking if it is possible to see big particles across the beam. Above 100 000 counts, you should close immediately. Follow the instructions about wind in the weather monitor. There are some intermediate situations, but the safest thing is to open only when the weather conditions are stable for about half an hour. You probably do not want to damage the telescope nor the instrument because of a little bit of data, which is probably useless. Do not forget to notify the other observers if you close because of poor weather conditions.

6. **Zero-ing the telescope**

Before moving the telescope, check the collision zones. Pay attention to the stairs, to the wheels that move the curtains, and the instrument. Be very careful all the time!

Choose a bright star close to the zenith (from The Astronomical Almanac) and type the coordinates on `Track82`. Alternatively, on `Track82`, you can click on `Setup` (bottom right) and select `Zenith stars`. A list of stars close to zenith will pop up. Select your star. Turn on the `RA tracking`. Move the telescope to the target, using the flexed coordinates, or click on `Set Object for GO` (top right) and holding `Shift` click on `GO`. When you are happy, click on `Setup` and `Update zeros`.

It is recommended to do this procedure every night, but it is essential if some maintenance has been done on the telescope during the day.

Now you are ready to go to your target! Type the coordinates in the same way as for the bright star and move the telescope.

7. **Focusing the telescope**

   You want the star to be as round and as small as possible. Change the exposure times if the counts are too high or too low. It is recommended to focus either on your target star or in a field nearby your target. On `Track82`, click on `Focus`. If you are on a target, a window will pop up with a plot of FWHM as a function of focus encoder. Change the value of the focus by clicking `In` or `Out` on `Track 82`. After acquiring several values, click on the plot and a parabolic fit should provide you the best focus value. You can delete wrong measurements by clicking on the plot.

   But remember, if you are in doubt, your eyes will always provide the best least square fit.

8. **Actual observing**

   - Make sure RA tracking is `ON`.
   - Create a sub-folder for the object in the current night folder.
   - Set up `LightField`: Exposure times: (e.g.) 4.998 s, Number of frames: 9999 (or a very large number),
     File name: target_name, Save In:
     D:\sync_to_White_Dwarf_Archive\YYYYMMDD\target_name
     Naming Options: uncheck boxes, Shutter Mode: Always Open.
     Click on `Run` then `Acquire` to save temporarily.
   - Open a navigator (e.g. google chrome), create a new tab and type in `https://github.com/ccd-utexas/tsphot/wiki/`. To start an `IPython Dashboard`, on Desktop, open `Windows Power Shell`, execute `ipython notebook`. To create a new IPython Notebook from the Dashboard, click on `Dashboard tab` in Chrome, click `New Notebook`.
   - `Autoguide script`: In the IPython Notebook tab for autoguide, change the path in the first line of the script to the current directory and target. Click on `Kernel` and `Restart`. Click `Shift-Enter` in each one of the steps of the script.
     This should send the images to `Guide 82`, if LightField is acquiring images.
   - Start to guide on a star by clicking on `Autoguide`. Change the box width to a value between 150 and 200. Place the guide box on the target. In the `Guide Box` window, right-click to the place the cross on top of the guiding star.

- When you are happy with the focus and the guiding, on `LightField` click on `Stop` and then `Acquire`. You are officially observing.

9. **Online reduction**

   (a) On LightField, make a small box around each star in the field, starting with the target. Click on the `lab beaker` icon (top right corner) and select `Show Statistics`. Record the location of the maximum.

   (b) In the target directory, right-click `New` > `Text document` to create a new text file called `phot_coords.txt`. Type in

   target_x target_y

   comparison_x comparison_y

   comparison_x comparison_y

   (c) In Chrome, create a new tab and type in `https://github.com/ccd-utexas/ts-phot/wiki/Online-analysis`. Click on `online_analysis.ipynb`. To start an `IPython Dashboard`, on Desktop, open `Windows Power Shell`, execute `ipython notebook`. To create a new IPython Notebook from the Dashboard, click on `Dashboard tab` in Chrome, click `New Notebook`.

   (d) `Online script`: In the IPython Notebook tab in Chrome for the online reduction, change the path in the first line of the script to the current directory and target. Click on `Kernel` and `Restart`. Click `Shift-Enter` in each one of the steps of the script.

   (e) On the directory for your target, a file named `lc.pdf` will be continuously updated. Drag that file to a tab in Chrome to view the online reduction. You need to refresh this to see the most updated light curves and Fourier transforms.

   Other files will also be created in the directory.

10. **Create logs:**

    (a) `Observation log:` Copy the file `Observing_Log_Template_for_LightField.log` from the directory `Data (D:)` to `Data (D:)\sync_to_White_Dwarf_Archive\YYYY-MMDD\target`. Rename this file to `TargetName_YYYYMMDD.log`. Double click on this file to edit it.

    (b) `Timing log:` Click on `Start Menu` > `Control Panel` > Shift-right click `Domain Time II Client`, click `Run as administrator` > `Yes`. In `Domain Time box`, click `Drift` > `Raw Data`. In the Notepad window, click on `File` > `Save As` > save in the target directory of the night the file as `DTC_drift_YYYYMMDDTHHMMSSZ.txt`.

11. **While observing:**

    Monitor the dome every 15-30 min to prevent occultation.

    Check the focus every 2 hours. Use 125 ms increments to focus while taking data.

    Monitor the weather. Remember to call the other observers when you close the dome.

12. **Changing targets:**

(a) Check that the `Domain Time Client drift data` was saved.

(b) On LightField, click `Stop`.

(c) In Chrome, on the online reduction tab, click `Kernel` > `Interrupt Kernel`. Then click `Kernel` > `Restart`.

(d) In Guide82, uncheck `Autoguide`. In Chrome, on the autoguide tab, click `Kernel` > `Interrupt Kernel`. Then click `Kernel` > `Restart`.

13. **End of the night:**

(a) **Export file SPE to fits**: On `LightField` click on the `Data` tab > Export Data.
On the window that pops up, select `Batch`, click `Add directory`, select the directory of the night (YYYYMMDD) and check box `Include all sub-directories`. Region of interest: `all`, Frames: `all`, Export to File Type: `FITS (.fits)`, Export as: `One File per ROI per frame`, check box `Include All Experiment Information`, Save Exported Files To: `Source File's Location`.
Click Export

(b) **Export file SPE to CSV**: On `LightField` click on the `Data` tab > Export Data.
On the window that pops up, select `Batch`, click `Add directory`, select the directory of the night (YYYYMMDD) and check box `Include all sub-directories`. Region of interest: `all`, Frames: `all`, Export to File Type: `CSV (.csv)`, Export as: `One File per ROI per frame`, Layout: `Table (one pixel per row`, CSV Columns: `FTN, ESTS, EETS`, Header labels: `Long names`, Exposure started unit: `seconds`, Exposure started precision: `All decimal places`, Exposure ended unit: `Seconds`, Exposure ended precision: `All decimal places`, Save Exported Files To: `Source File's Location`.
Click Export

(c) On LightField, change the temperature of the camera to the current air temperature. When the temperature reaches that value, power off the camera, then close LightField.

(d) Proceed with normal shutdown for 2.1 m telescope. Close the dome, lower the upper curtain, close the mirror cover and the baffle tube, bring the telescope to 0 HA and -20 DEC, park dome slit East, power off the telescope.

(e) Back up files:
On Desktop, click on `WinSCP`. login: lonestar.tacc.utexas.edu, Portnumber: 22, Username: ccd, Password: xxx, click `login`.
The left side is for the local files (`D:\sync_to_White_Dwarf_Archive`) and the right side is the remote session (`/home1/02109/ccd/Shortcut_to_White_Dwarf_Archive-/ProEM_1024B`). On the top left side, click on `Synchronize`.
Local directory: `D:\sync_to_White_Dwarf_Archive`, Remote directory: `/home1-/02109/ccd/Shortcut_to_White_Dwarf_Archive_ProEM_1024B`, Direction/Target directory: Remote, Mode: Synchronize files, Synchronize options: Preview changes, Comparison criteria: File size. Click `OK`.
Review synchronization checklist. Select only directories to synchronize.

Now you can go to bed, because tomorrow is another day (or night)!